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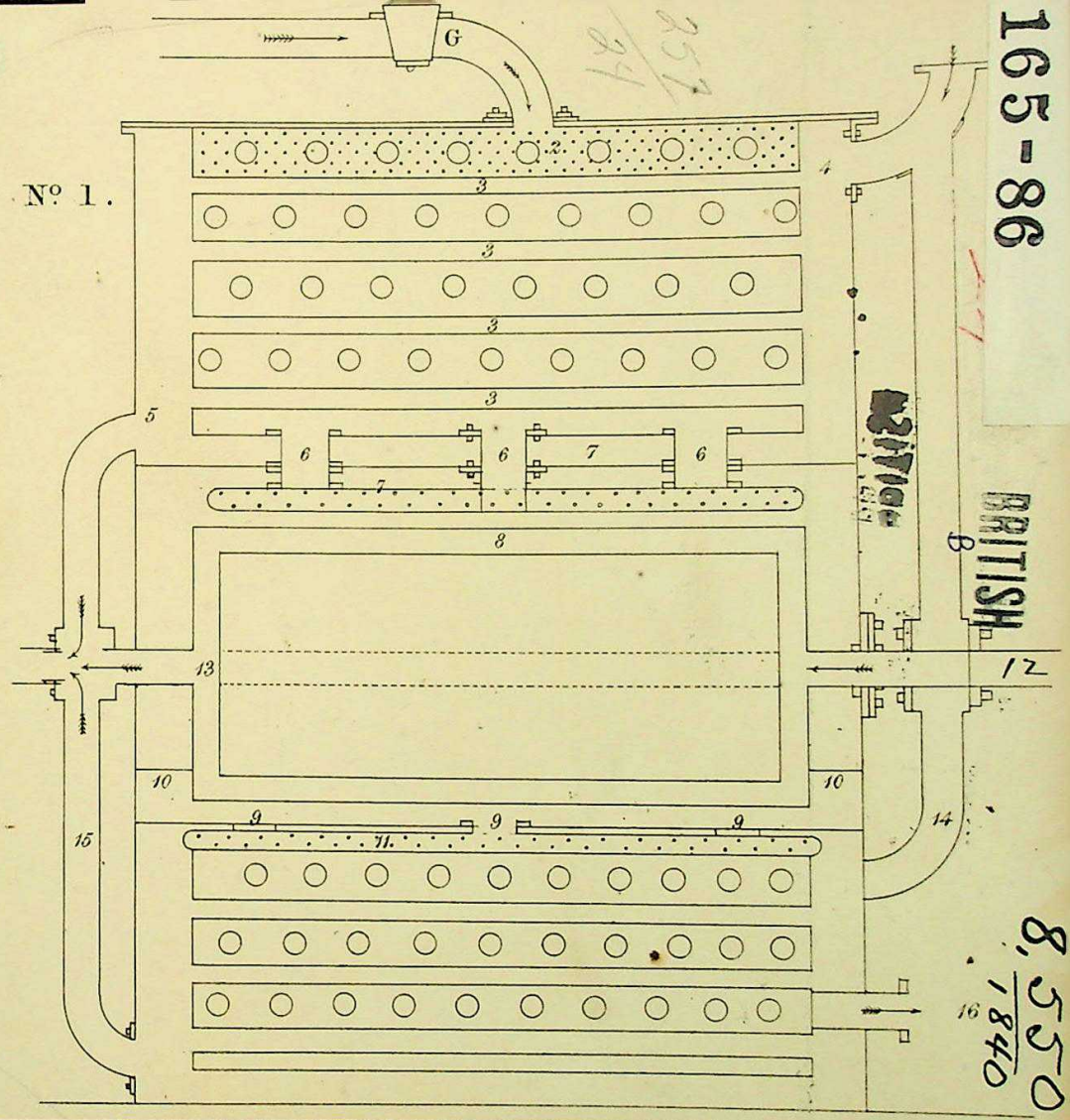

The Enrolled Drawing is partly colored.

London. Printed by George Edward Eyre and William S
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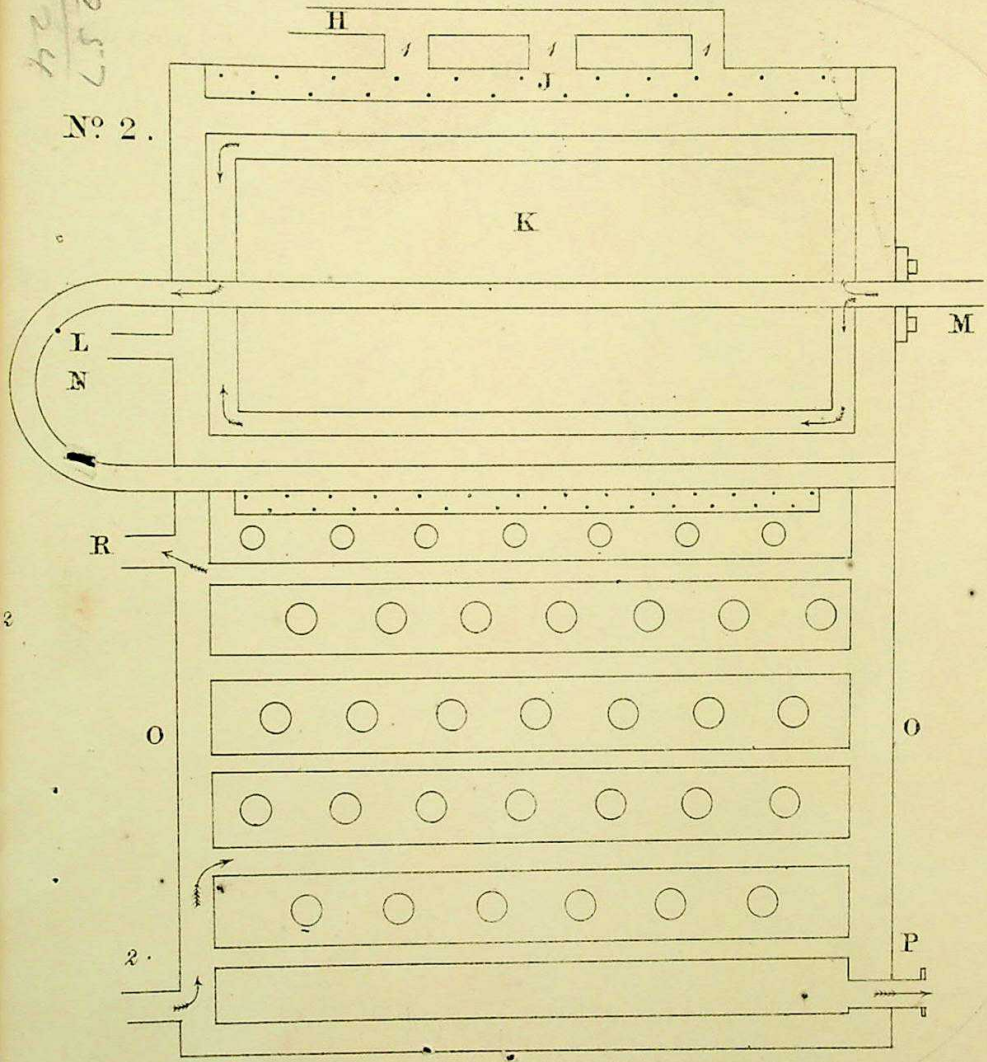

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BRITISH

A.D. 1840 . . . . . N° 8550.

Apparatus for Generating Steam and Evaporating Fluids.

AITCHISON AND HASTIE'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, we, JOHN AITCHISON, of Glasgow, in Scotland, at present residing at N° 144, Minories, in the City of London, Merchant, and ARCHIBALD HASTIE, of West Street, Finsbury Square, in the County of Middlesex, Merchant, send greeting.

WHEREAS we did by petition represent unto Her most Excellent Majesty Victoria, that we had invented "CERTAIN IMPROVEMENTS IN GENERATING AND CONDENSING STEAM, HEATING, COOLING, AND EVAPORATING FLUIDS," and Her said Majesty being willing to encourage all useful Inventions, did issue Her Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Twenty-fourth day of June, in the fourth year of Her reign, whereby Her said Majesty did, for Herself, Her heirs and successors, give and grant unto us, the said John Aitchison and Archibald Hastie, Her especial licence that we, the said John Aitchison and Archibald Hastie, our exors, admors, and assigns, or such others as we, the said John Aitchison and Archibald Hastie, our exors, admors, and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, and also in all Her Majesty's Colonies and Plantations abroad, our said Invention, in which said Letters Patent there is contained a proviso obliging us, the said John Aitchison and Archibald Hastie, by an instrument in writing under our hands and seals, particularly to describe and ascertain the nature of our said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in Her Majesty's High

Court of Chancery within six calendar months next and immediately after the date of the said Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, we, the said John Aitchison and Archibald Hastie, do hereby declare that the nature of our said Invention, and the manner in which the same is to be performed, are described and ascertained in manner following, reference being had to the Drawings hereto annexed, and to the letters and figures marked thereon.

A is a longitudinal section or side view with the brickwork of a common waggon steam boiler. Figure 1 is the door of the furnace. Figure 2 is the ash pit. Figures 3, 3, 3, are the fire bars and bearers, which are all hollow. Figure 4 is the bridge, which is also hollow, made of fire bricks; the flame and hot air from the furnace passes over the bridge in the usual manner, and is carried through flues, as shewn under B in the end view, Figures 5, 5; the course of the flame and hot air is shewn in C, Figures 6, 6, and passes into the chimney or vent, Figure 7, in addition to the heated surface, thus acting on the bottom and round the sides and ends of the boiler; a current of air enters at the two orifices, as shewn in C, Figures 8, 8, through a pipe, and enters the front hollow bearer 3, that support the fire bars 3 in the furnace, and passes inside of these into a hollow back bearer 3 next the bridge, Figure 4, and is conducted into an air chamber along the side of the furnace under the toe or under edge of the boiler, as shewn in B, 10, from which it is conducted by the pipe 10 into a box, Figure 11, inside of the boiler A. In this box are fixed a number of copper tubes, Figure 12, similar to those in a locomotive boiler; the hot air in these pipes or tubes passes into the box, Figure 13, at the opposite end, and is drawn up into the fan box, Figure 14. Part of this air passes into the pipe, Figure 15, and is carried into and up the chimney or vent, and the other portion of it is driven or forced down by the action of the fan wheel 14 into the reservoir or pipe 16, 16, communicating and entering at the back of the hollow bridge 4 in A, and proceeds in a separate pipe along the side of the furnace, and ascends by Figure 10 into the box 11 inside of the boiler. There is also a supply of air received into a metal worm communicating with a double surfaced cylinder, in both of which air enters through a small orifice or pipe outside of said chimney vent or funnel; the cylinder and worm receives the heat that passes up through the chimney or funnel, but not shewn in the Drawing. This supply of warm air is carried through the brick chimney, or if an iron funnel, by a pipe leading into the reservoir or pipe 16. Figures 17, 17, 17, 17, in A shew the revolving double surfaced cylinders, which we describe as follows; that is to say, they

are made of sheet copper, embossed with small hollow circles so as to increase the heating surface; these cylinders are brazed and rivetted upon metal rings at each end, having a space within to contain hot air of about two inches, more or less, and are made both air and steam tight, and further also to increase the heating surface a copper worm or coil of pipe of about two inches diameter is placed outside and inside of the heating surfaces of the cylinder, and communicating therewith at each end. The cylinders, together with the fan wheel, are made to revolve by an endless flat chain and pulley worked by the steam engine or other motive power. The hot air enters by the hollow gudgeon or journal through stuffing boxes 18 and 19, and fills the worm or coil of pipe and inside space of the double cylinder, as shewn in F, and passes out at the end opposite down through the other hollow arms and gudgeon, and proceeds forward into the box in A, 13, and from thence into the fan box 14, and is partly discharged into pipe 15, and conducted by it into the chimney or vent, as before mentioned. D is a bird's eye view of the revolving cylinders, pipes, and boxes in the inside of the boiler for generating steam. E is an end view of two double cylinders, one within the other; and F is a section of that cylinder when very extensive heating, cooling, and evaporating fluids is required.

Having described our improvements in generating steam and heating fluids, we now describe our improvements in condensing and cooling them. N° 1, G, in the annexed Drawing, is a pipe with a cock for conducting steam or hot water, which is distributed through a copper cullender, Figure 2, over a number of copper pipes or tubes placed in a cased cistern, crossing each other at right angles, Figures 3, 3, 3, 3. These tubes or pipes are filled with cold water supplied by pipe, Figure 4, and discharged at Figure 5; the condensed steam or hot water is discharged by pipes, Figures 6, 6, 6, into another copper cullender, Figure 7, which condensed steam or hot water passes and falls down on the surface of the double surfaced copper cylinder, Figure 8. On the outside surface of this cylinder there are fixed several narrow buckets which receive the water from Figure 7; and the weight of this water gives the cylinder a rotatory motion. After the water has passed over the surface of this double cylinder, it falls into a copper pan, Figure 10, and from the pan 10 discharges by openings through three pipes 9, 9, 9, into the cullender, Figure 11, and which distributes as in Figure 2 before mentioned. The cold water for the cylinder enters through the hollow gudgeon and journals at Figure 12, and is discharged by pipe, Figure 15; the steam or hot water that entered by Figure 1 being now thoroughly condensed and cooled, is discharged at Figure 16, and may be used for injection to a steam engine condenser or any

other purpose. N° 2 in the Drawing shews another improvement in condensation and cooling of fluids. H is a cold water pipe, the water in which is discharged into the cullender J by three openings 1, 1, 1, from which it falls upon the double surfaced cylinder K into several buckets placed lengthways on the outside of the cylinder, which makes it revolve, or may be made to revolve by tooth gear driven by power from the steam engine. This cold water discharges itself at L. The steam or hot water enters at M, passes through the hollow journal or gudgeon and stuffing box of cylinder K, and at the opposite end passes it through the bent or curved pipe N into a copper cullender placed on the top of box O, which box contains a great number of pipes or tubes placed in rows at right angles; the hot water from the cullender passes over the surface of these pipes or tubes down to the bottom, and is discharged at pipe P, and can be used for condensation for a steam engine or other purpose. The pipes in box O are filled by a current of cold water from pipe Q, which water is discharged at pipe R. A further improvement consists of a box containing a number of pipes or tubes similar to those in box O last mentioned; and N° 2 in the Drawing are placed in the condensers of land and marine engines, and these pipes are continually filled with a current of cold water supplied in like manner as in box O, which has the effect of partly condensing the steam, and so lessening the quantity of cold water at present necessary for injection. The quantity of air, steam, hot and cold water, or other fluids will be regulated of course by proper stop cocks or valves in the usual manner. We do not confine ourselves by the description hereinbefore given of our improvements to the common waggon boiler, as shewn by A, because these improvements are equally applicable to locomotive and marine boilers and furnaces, and also can be made of great utility to such establishments as require to generate and condense steam, heat, cool, or evaporate fluids.

Claim.

First, the mode of application of air heated through hollow fire bars and bearers, and conveying the said air up to the boxes, tubes, and revolving double surfaced cylinders, inside of a boiler.

Second, the supplying heated air from the worm and double cylinder placed and fixed in the vent funnel or chimney into the reservoir behind, and into the hollow space in the fire bridge.

Third, the returning a portion of the hot air, partially cooled, in the pipes or tubes and revolving cylinders in the boiler by the fan wheel or pump, on purpose to be again heated in its passage in the air reservoir behind, and within the fire bridge.

Fourth, the generating of steam by a thin stratum of water that rises from the heated surface of the revolving cylinder inside of the boiler.

Fifth, by embossing those double cylinders, and thus obtaining a very large additional surface for heating fluids.

Sixth, the condensing steam and cooling it, and also hot water or fluids, by revolving double surfaced cylinders.

Seventh, the hot condensed water or fluids, cooled by means of dropping or falling through cullenders pierced with very small holes.

Eighth, we claim our further improvement in fixing or placing a box containing a number of pipes or tubes, similar to those in box O, into the condensers of land and marine engines, which pipes are continually filled with a current of cold water supplied in like manner as in box O, which has the effect of partly condensing the steam and so lessening the quantity of cold water usually used for injection.

In witness whereof, we, the said John Aitchison and Archibald Hastie, have hereunto set our hands and seals, the Twenty-third day of December, in the year of our Lord One thousand eight hundred and forty.

JOHN (L.S.) AITCHISON.
ARCH. (L.S.) HASTIE.

AND BE IT REMEMBERED, that on the Twenty-third day of December, in the year of our Lord 1840, the aforesaid John Aitchison and Archibald Hastie, came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Rose.

Inrolled the Twenty-third day of December, in the year of our Lord One thousand eight hundred and forty.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISWOODE,
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BRITISH